STATIC FOETAL CADAVAR IN DOMESTIC ANIMALS- A REVIEW

A .Thangamani*
Veterinary Gynaecology and Obstetrics, Annadurai Mobile Veterinary Clinic, Sithathur-605 701, Villupuram, Tamilnadu, India

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ABSTRACT

Domestic animal met with pregnancy losses either in the form of expulsion before term (Abortion) or foetus retained in utero (Mummification and Maceration) without expulsion accompanying with failure of lysis of corpus luteum. Instead, resorption of placenta and foetal fluids followed by dehydration of foetus and foetal membranes lead to a uterus which is tightly contorted around the foetus. The physiological phenomenon for maintenance of pregnancy varies from species, that giving different pathway for the mummification condition. The exact precipitation factor are unpredictable, and is influenced by multi factorial causes, including the cause of foetal death, stage of pregnancy, and the number of foetuses. The objective of the current article is to review the type, incidence causes, clinical sign, diagnosis, treatment protocol for foetal mummification in different domestic species. Prognosis and future fertility in dam affected with this type of gestational accident still debatable. Prognosis and subsequent fertility after treatment are discussed. Combination of exogenous hormonal therapy as choice of treatment in large animal.

***Key words*:** Domestic animal, foetal mummification, hormonal therapy, pregnancy losses

Introduction

Foetal mummification is not common in most domestic species of animals. Most commonly addressed in polytocous species like swine and dogs. It is also reported in monotocous animals like cow, mare when the foetus is retained for prolonged time. Based on the foetus development and viability, the failure of pregnancy is divided into 2 categories such as: Embryonic mortality and Foetal death. There are unpredictable causes behind the foetal mortality followed by stage of pregnancy at which foetal death occurs and total number of foetuses involved. The various findings revealed the possible outcome of foetal death is mummification. The foetal mummification was highly encountered in porcine species (Kennedy *et al.,* 1993) followed by small ruminants like sheep and goat (Hailat *et al.,* 1997; Tutt, 1997 and Mane *et al.,* 2010) cow (Barth, 1986), dog, cat (Johnston and Raksil, 1987) and horse (Mayers and varner, 1991).

Mummification process is opposite to the autolysis (or) decomposition. In normal autolysis process occur by release of biological enzymes that normally present in the body organ like liver, intestine and muscle followed by breakdown of organic matter by the bacterial action lead to putrefaction. But in the mummification process closed cervix with reduced oxygen concentration inhibits the autolysis process. So that the bacteria not able to withstand the uterine environment and leads to failure of decomposition process.

The dehydration of foetal body is also an important factor in the mummification process: (Janaway *et al.,* 2008) conducted experimental studies in Peru that showed when water level in the foetal tissue is decreased below a critical threshold, bacterial invasion and putrefaction is inhibited and results in desiccated and body of the foetus contorted. Drost (2007) opined that the following mechanism need for complete mummification process to occur: 1) Foetal death occur after the development of skeleton (because soft tissue even autolysis by body enzyme itself). 2) Rapid resorption of foetal as well as uterine fluids, and 3). Absence of bacteria in the uterus. Normally, in vagina and vestibule commensal organisms are present and they are unable to enter into the pregnant uterus due to closed cervix, and additionally intact endometrium is present which prevents the entry of organisms through maternal vascular system. The entire mummification process takes about weeks to month; it depends upon the time of foetal death. Finally all the foetal and uterine fluids are resorbed by the maternal system, the dried foetal membranes and uterine wall contract over the foetus. Absence of secretion of uterine PGF_2 alpha leads to failure of lysis of CL that maintains the pregnancy for longer period due to secretion of progesterone hormone.

Types of mummification

1) Papyraceous mummification: The name implies parchmant paper like foetal membranes. In this, foetal membranes are shriveled and dried, stiff-foeto placental unit without exudates and has been recorded in dogs, cats, pigs, sharks and equines (Noakes *et al.,* 2009).

2) Hematic mummification: In this condition uterine and foetal fluids are resorbed, but the surface of foetus and foetal membranes surrounded by a brown colour, viscous material that may be originated from caruncular bleedings (Noakes *et al.,* 2009). This condition has been recorded in cattle, buffalo and dogs (Sandoval and Garayzar, 2008).

Incidence

Incidence of mummification of foetus varies from one species to other species. Different species have their own physiological mechanism to maintain the pregnancy by hormone produced from various sources like corpus luteum and placenta. Cattle and goats considered to be a progesterone dependent species which can produce from CL; however in cattle progesterone produced from placenta at 150 and 200 days of gestation, it can capable to maintain the pregnancy. The incidence of bovine foetal mummification has been reported to be as high as 5% (Hornaday, 1947) but generally less than 2% (Barth, 1986). Foetal mummification most commonly observed in Guernsey and Jersey cattle, however reports on foetal mummification in crossbred cattle also

* Corresponding author, email:thangamtamil19@gmail.com

recorded recently (Srinivas, 2007 and Kumaresan *et al.,* 2013). Roberts (2004) stated that incidence foetal mummification occur in domestic animal, but uncommon in sheep and goat seem to accounted a higher prevalence of foetal mummification when compared to cows (Lefebvre, 2015). Reports regarding foetal mummification in mare are very rare. One case study reported that in the equine population of Michigan. Two cases of mummification were reported in mare among 290 cases of abortion (Tengelsen, 1997). In mare and cow the mummification occurs between third and eighth month of gestation after formation of placenta and foetal ossification (70 days of gestation). Reports regarding prevalence of foetal mummification in swine are variable. A prevalence of 3.45% to 6.8% (Van de Lande and Van Rens, 2003; Borges *et al.,* 2005 and Schneider *et al.,* 2012).

Prevalence of foetal mummification in dogs is mostly associated with infectious causes with canine herpes virus. Green (2012) conducted serological surveys in domestic dogs that revealed prevalence of 30%-100% in dog affected with canine herpes virus infection associated with foetal mummification. Pregnancy losses in feline family associated with abortion, stillbirth and foetal mummification (Green, 2012).

Etiology

It may be of infectious or non-infectious. Various authors recorded that infectious origin as a precipitating factor for foetal death in small animals (dog, cat, swine and some extend in sheep and goat), where as in large animals (Cattle and horse) most probably defective placenta or lack of space in the uterus to guard the foetus in the *in utero* environment.

Clinical findings

Most of the cases presented to the ward with history of absence of parturition signs even though gestation period is completed. Lefebvre *et al.* (2009) recorded that 63% of cases suspected for mummification are established after the farmer notices that the cow's abdomen is unusually small in size for a given stage of gestation. Unlike cows and mares, mummified foetus in sheep and goat are spontaneously aborted, that is usually observed in the last trimester of pregnancy. No observable clinical findings are seen in mare regarding mummification and it can be found only during dystocia (or) prolonged gestation. Regarding swine species the systemic signs were not observed obviously. In canine the clinical signs are exhibited in the form of abortion, discomfort on abdominal ballottement, weight loss and depressed activity. Mummified foetus is usually found incidentally in queen during abdominal surgery or cesarean section.

Diagnosis

1. Large animal

Diagnosis of foetal mummification in large animals is not a complicated procedure.

(a) Trans rectal palpation (TRP):

* Whole foetal parts are palpable at pelvic brim level itself with contracted uterus over the foetus.
* Absence of foetal fluids, placentome, fremitus.
* Immobile foetal mass.

(b) Per vaginal examination:

* Completely closed cervix (or) sometimes partially opening of external os.
* Contracted foetal parts palpable at vaginal wall.

(c) Trans rectal ultrasonographic examination (TRUE)

* Absence of anechoic foetal fluid with shadow of foetal structure
* Absence of heart beat.

(d) Physical examination: Not able to recognize the foetal structure in the abdominal cavity on external abdominal palpation. Decreased milk production rarely reported.

2. Sheep and goat

(a) Trans abdominal ultrasonography

Most of the time mummified foetus delivered along with normal healthy foetus. However sometime prolonged gestation with absence of parturition sign indicated for abdominal ultrasonography. It differentiate the normal pregnancy from abnormal gestational accident. Absence of heart beat with lack of foetal fluid suggestive of foetal mummification. Right lateral abdominal radiography imperative for position followed by length of mummies, through that planed for type of treatment either cesarean section (or) pervaginal delivery.

(b) Culture findings

Toxoplasmosis infection could be identified from serological method by using maternal serum (Dubey, 1990) whereas Chlamydia infection identified from impression smear from cotyledon (or) uterine discharges (Edmondson, 2012). Usefulness of identification organism was able to prevent the future gestational accident and diseases associated with that organisms.

3. Swine

In swine species also mummified foetus delivered along with other healthy litters like as sheep and goat (Zimmerman *et al.,* 2006). Infectious causes more when compared to non-infectious causes for participation of foetal death at gestation. Porcine parvo virus (PPV) infection precipitated most of the time as a cause of foetal mummification in swine. Serological technique like fluorescent antibody test (FAT) and enzyme linked sorbent assay (ELISA) used for confirmation of PPV and PRRSV infection (Zimmerman *et al.,* 2006).

4. Dog and Cat

Canine herpes virus isolation is commonly practiced from kennel with report of mummification in previous batch of bitches and characteristic pathological changes observed in affected new born puppies, include mummified foetus. Carrig *et al.* (1972); Johnston *et al.* (1987) recorded that in cat extra-uterine foetal mummies have been accidentally found in the abdominal cavity covered with omentum or mesentery by USG, radiography and during abdominal surgery.

Treatment method

Various treatment protocols are practiced for foetal mummification from conservative (or) medical management to cesarean section. The drug should have the following character to expel the mummies, such as 1] Lysis of persistant CL, 2] Stimulate the uterine contraction, 3] Relaxation of pelvic structure followed by cervical dilation. Other than large animal cesarean section or abdominal surgery indicated to remove the mummies (Lefebvre, 2015). Considering large animal and some extend in small ruminants the first treatment of choice is medical treatment with exogenous hormones. *Corticosteroids*

are not useful with regards to foetal mummification, because steroids act only on the functional foeto-placental unit.

1. Prostaglandin analogues: Either prostaglandin F2 alpha (or) PGF_2 alpha combination with PGE_2 gives precious result; however, it is not economic. Single dose of PGF_2 alpha gives low parturition induction with uterine contractility defect (Vandeplassche *et al.,* 1974). One study reviewed that, in situation where single dose of PGF_2 alpha did not lead to expulsion of the mummies, for that different combination hormone was used. Mummified foetuses are expelled after 3 to 6 days of combination of treatment with PGF_2 alpha analogue like 600 µg of cloprostenol intramuscularly and PGE_2 analogue like 2.5 mg dinoprostone intravenously (Hirshbrunner and Kaufmann, 2005). Hirshbrunner *et al.* (2003) conducted a study on uterine motility during diestrus in experimental cows by using combination of prostaglandins analogues that showed characteristics uterine motility. Synergistic effect of combination of PG's may explain the increased success rate when compared to PGF_2 alpha injection alone.

2. Oestradiol compound: Many authors fail to achieve the cervical dilation after administration exogenous prostaglandins. Instead of prostaglandins oestradiol compounds achieved good cervical dilation (Lefebvne *et al.,* 2009), because they relax the cervix and sacro-sciatic ligament, although they tend to change the conformation of cervix. But the disadvantage of oestradiol compound was seems not as good as normal fertility maintenance.

3. Hysterotomy: Different surgical interventions are available to remove the mummies. At most cesarean section was followed in different decades. Because after removal of mummies, uterine lavage is important to remove the debris of foetal structures and uterine discharges, for future fertility. Left caudal flank approach have been used as a last resort when mummified foetus that cannot be expelled by prostaglandin injection (Wolfe *et al.,* 1990). Sometime distance of uterine horn with mummies not accessible through this method, for that tocolytic agents are indicated for uterine relaxation (Boileau *et al.,* 2001).

4. Colpotomy: Hysterotomy through pervaginum is termed as colpotomy (Accessibility of uterine horn through per vaginum). In this method pregnant horn reaches through incision on the dorsal vaginal wall. Disadvantage of this method is uncontrolled bleeding (or) not able to withdraw the large mummies (Stevens and king, 1968). Large size of the mummies could be relieved by colpotomy followed by mummectomy.

5. Mummectomy: Mummectomy is an obstetrical procedure which involves reduction of mummies size by using obstetrical instrument through incomplete/completely dilated cervix or through colpotomy approaches for per vaginal delivery. Mummectomy procedure validated when mummified foetus present in accessible distance in the uterine horn.

6. Combination of oestradiol and PG compounds: Even though oestradiol and prostaglandins were different mechanism of action on termination of pregnancy, combination of both two compounds (2 mg oestradiol valerate, 500 µg cloprostenol) could gives very good results in terms of expulsion of mummies followed by without affecting much on future fertility (Kumaresan *et al.,* 2013). High dose estrogen may hinder the future fertility.

Prognosis and subsequent fertility

Following medical (or) surgical management expulsion of the mummified foetus, most animal recover promptly since no infection is present (Roberts, 2004), moreover conception occurs within three oestrus after treatment (Kumaresan *et al.,* 2013). In one study recorded that 36% conception rate was achieved after extraction of the mummies through hysterotomy and 0% conception rate after medical treatment followed by manual extraction (Lefebvre *et al.,* 2009). In cats and mare the long term fertility of dams following foetal mummification is difficult to analyses. The evaluation of fertility parameter in female animals met with mummification condition is difficult, because worthless females were often slaughtered as recommended by recent policy slaughter methods. Roberts (2004) opined that cow with history of one mummified foetus may possibilities of another one at any point of next pregnancy period; hence the dam's prognosis regarding subsequent fertility always be guarded.

Preventive measures

Even though the foetal mummification is unpredictable regarding etiology, the proper attentive management and sanitary protocols followed by preventive measures like vaccination, quarantine, isolation were all of obligatory importance in species (Dog, cat, swine, sheep and goat) where infectious origin as a cause of mummification. Regular interval of pregnancy diagnosis is paramount important regarding large animal (cow, mare).

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